DESIGN OF SINGLE-BOUNCE MONOCAPILLARY X-RAY OPTICS

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Elliptically-shaped hollow glass capillaries have become the customary optic used to do micro x-ray beam experiments at the Cornell High Energy Synchrotron Source (CHESS). We have been able to manufacture optics that have designed spot sizes from 5 to 20 \textmu m, gains in intensity of 10 to 500, divergences from 2 to 9 milliradians and working distances between the tip of the capillary to the focus ranging from 20 to 60 mm. Capillaries can also be employed in secondary focusing situations where weaker upstream focusing (such as from crystals and mirrors) is aided with a downstream capillary to produce and even smaller spot size.

We will be covering the basics in capillary design and explore the question of how well a single bounce monocapillary can best match synchrotron x-ray sources to particular experiments. We will cover some of the recent applications that have made use of the capillary optic in confocal x-ray fluorescence, microbeam powder x-ray diffraction, microbeam protein crystallography, and microbeam SAXS.